4 Compiler Construction (tgg22)

(*a*) Show that the following grammar for the language of balanced parenthesis is ambiguous.

$$\begin{array}{rcl} S & \rightarrow & \epsilon \\ & | & (S) \\ & | & SS \end{array}$$

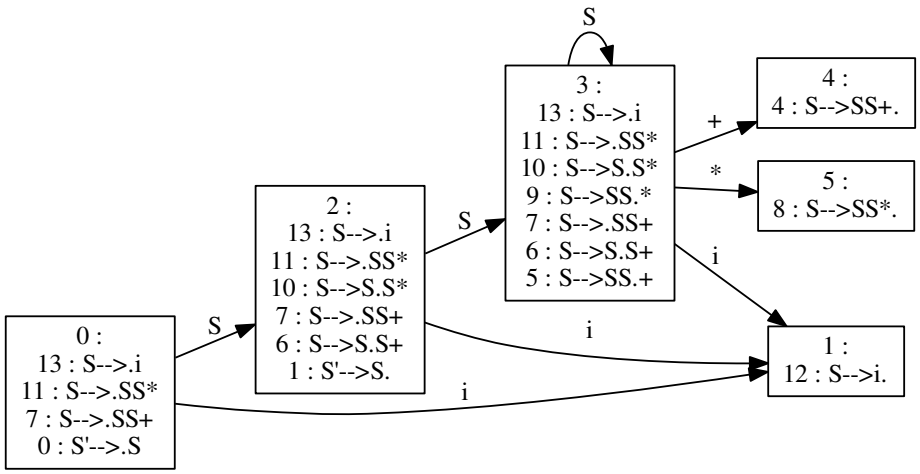
[5 marks]

(*b*) An arithmetic expression such as $x * ((z * u) + y)$ can be represented without parenthesis in postfix notation as $xzu * y + *$. This representation is ideal for evaluation using a stack machine.

Below is a simple grammar for postfix expressions:

$$\begin{array}{rcl} S & \rightarrow & i \\ & | & SS+ \\ & | & SS* \end{array}$$

The terminal i represents the lexical class of identifiers. Here is a DFA for the LR(0) items of this grammar.



(*i*) Using the DFA, construct the SLR(1) *ACTION* and *GOTO* tables for this grammar. Explain your work. [6 marks]

(*ii*) Show a trace of a parsing of $w = iii * i + *$. Justify every step. [9 marks]